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Industrial Cooling Water Simulation and Analysis

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Industrial Cooling Water (ICW) System and WaterGEMS Modelling

The ICW system provides water for cooling and fire protection to infrastructure throughout FNAL. WaterGEMS is a hydraulic modeling software that provides an environment to confidently analyze, design, and optimize water distribution systems. Future advancements at the lab will exceed the existing ICW capacity, based on the current model. Many solutions have been proposed to meet increased demands, this effort focuses on the addition of water towers.

Water Tower Modelling

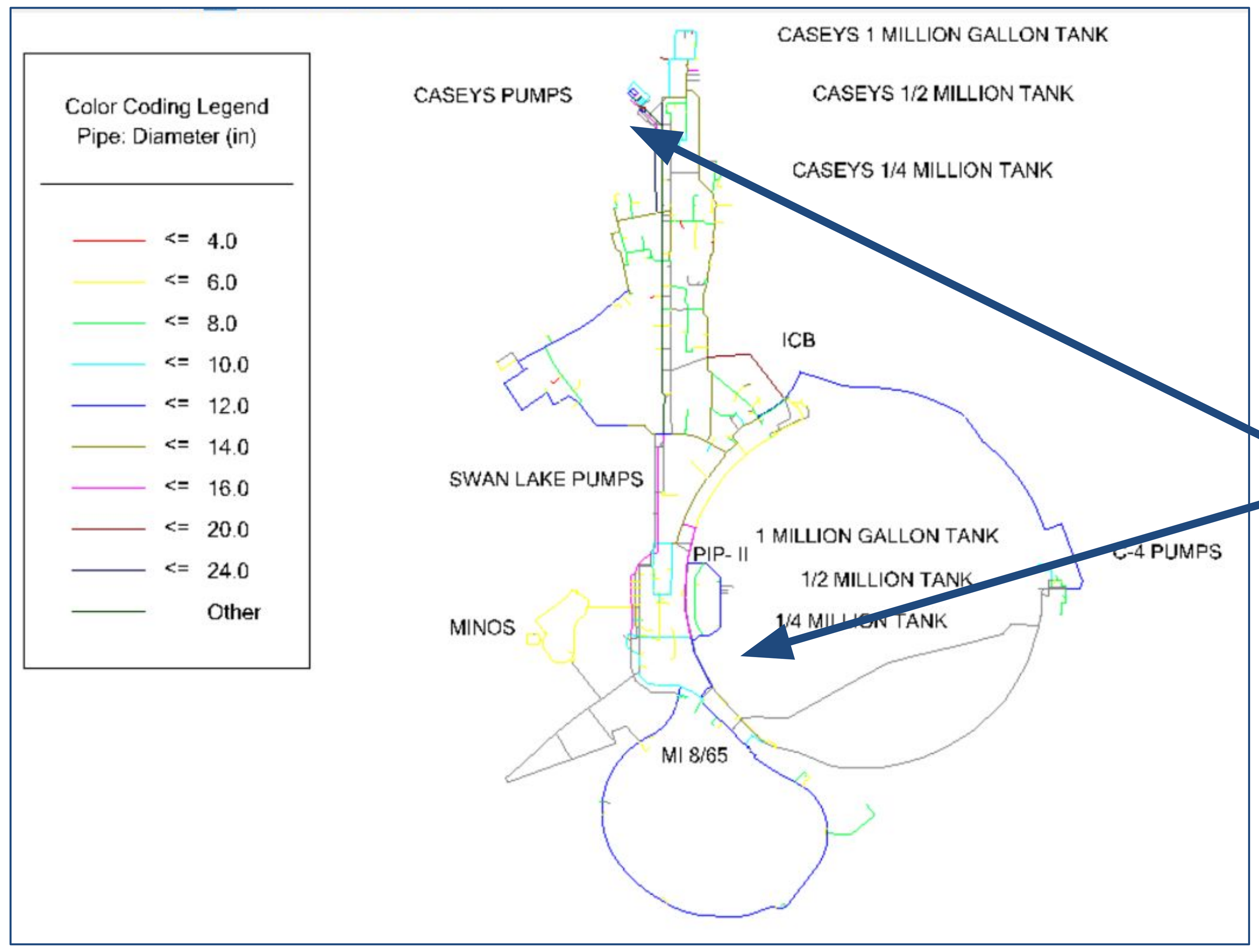

Figure 1: Full Picture of Simulated WaterGEMS ICW Model

Figure 2: Example Water Tower

Three water tower volumes were simulated under three demand scenarios at two potential locations. The tower volumes simulated were 0.25 Million Gallons (MG), 0.50MG, and 1.00MG. The scenarios tested were *Firm Capacity* meaning the towers must provide 11,725 GPM to substitute a limited pump shutdown for 8 hours. *Firm Capacity & Fire* which added a demand of 2,000 gpm for 2 hours at 3 different locations, and *All pumps off with fire* in which only the potential energy in the water system was available to maintain any supply of ICW.

Results

The simulations showed the 1 MG tower at Casey's pumps provided the most amount of time for demands to be met during the three scenarios. The smaller towers at either location could not meet the total demand. Smaller towers at Main ring came closer to meeting demands.

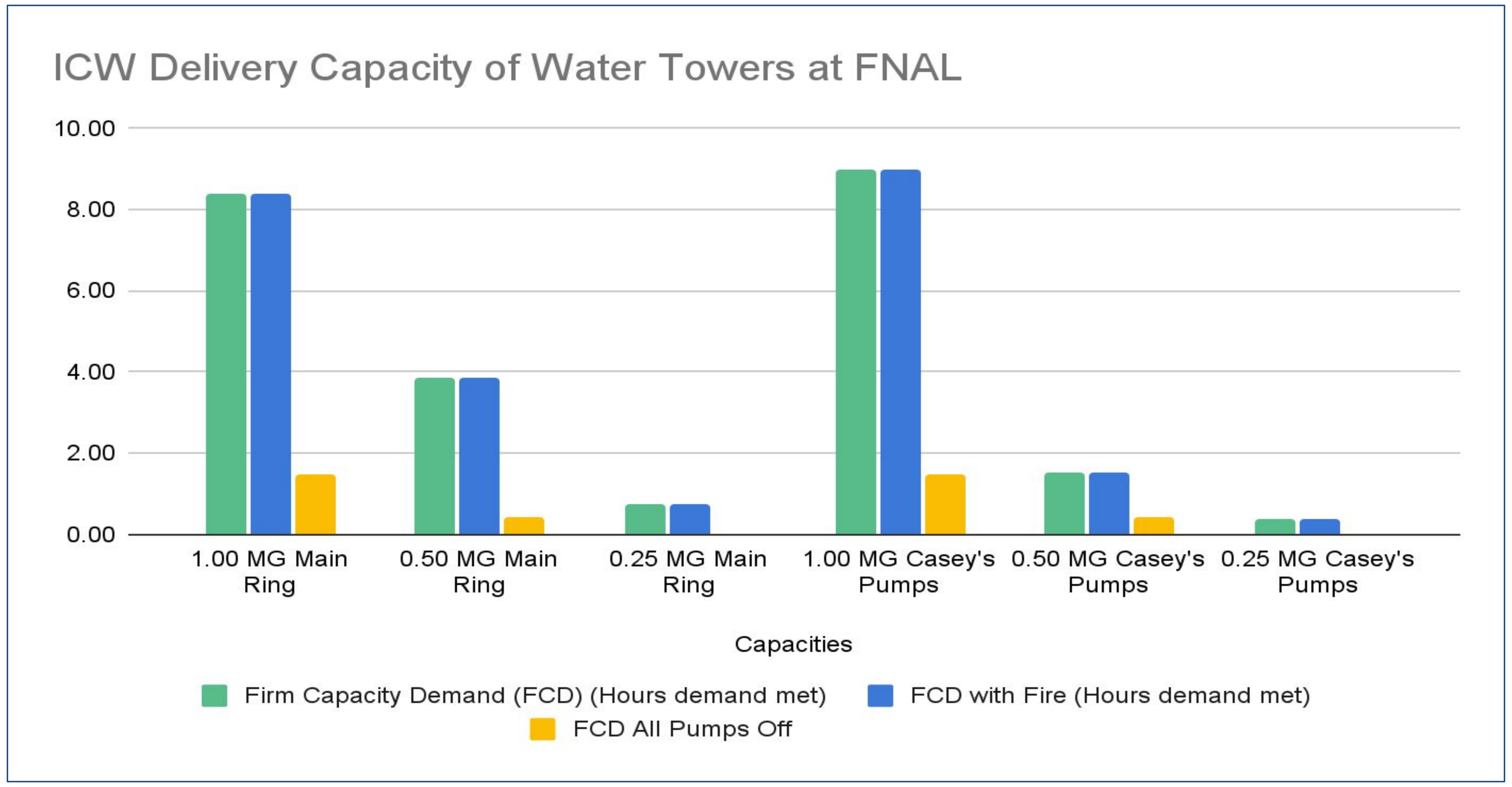

Figure 3: ICW Delivery Capacity of Water Towers at FNAL

Conclusions

The potential to implement a new water tower is of high interest for the lab to support upcoming experiments. To meet demands, the 1 MG tower at Casey's pump is the right choice. If value engineering is required this data indicates the Main ring may provide a better option. The proximity to various technical systems and key buildings may result in the greatest impact with the least volume. Greater volumes would allow even more redundant capacity in the case of an emergency and maintenance operations.

Acknowledgements

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